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LEPROSY: FLIES IN RELATION TO THE TRANSMISSION OF THE DISEASE

(A PRELIMINARY NOTE)

JAMES A. HONEIJ, M.D.
AND
RALPH R. PARKER, B.Sc.
(Penikese Hospital Laboratory)

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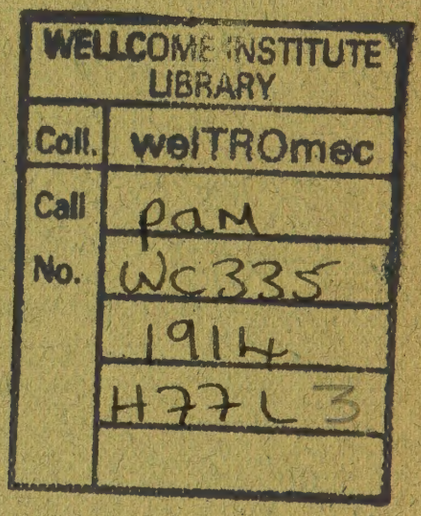

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LEPROSY: FLIES IN RELATION TO THE TRANSMISSION OF THE DISEASE.*

(*A Preliminary Note.*)

JAMES A. HONEIJ, M.D., AND RALPH R. PARKER, B.Sc.
(*Penikese Hospital Laboratory.*)

We have undertaken a systematic examination of flies and fly excreta in an attempt to determine whether the bacillus of leprosy may be so conveyed. Some experimenters, notably Leboeuf,[1] Currie,[2] and Wherry,[3] have made observations, but there is still insufficient evidence on which to base definite conclusions. Currie expresses his surprise that, notwithstanding the interest shown on the subject of insects and particularly flies as carriers of disease, published researches are so few as regards leprosy and flies. The conclusions from these few reports are of a positive nature, showing the possibility of the transmission of leprosy from patients to healthy individuals through flies depositing their excreta containing bacilli on the skin where there is a possibility of the bacilli being rubbed in.

The numerous observations made with other diseases and their transmission by flies are well known and form a good foundation for further work along these lines. Having Currie's and Leboeuf's work in mind, we commenced the following experiments.

After a considerable number of preliminary steps, we attempted to determine:

a. The length of time for complete engorgement of the fly;
b. The average length of time before the digestive tract was empty;
c. The average number of excreta deposits per fly;
d. The average length of time before first excreta deposit.

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We then undertook to determine:

a. Whether the acid-fast bacillus found in leprosy is carried by flies;
b. The number of flies in whose excreta bacilli are found;
c. Whether bacilli are present in "vomit spots;"
d. Whether flies found at an approximate distance of two hundred and fifty yards from the patients' dwellings contain the bacilli;
e. What species of fly is most worthy of consideration.

In all, ninety-five flies were used in these experiments and in a large number of cases many of the same flies were used several times. The following species were employed:

Musca domestica	59
Muscina stabulans	3
Stomoxys calcitrans	30
Lucilia sp.	2
Sciomyzidæ (undetermined)	1
	95

Female flies were used in about the same proportion as males, for control purposes.

It was thought necessary to take the following precautions:

1. Each fly had a complete individual number and record.
2. In collecting excreta, glazed oiled paper and cover-slips were used, to prevent absorption and to show deposits more clearly.
3. A red-colored solution (fruit extract) was used for more accurate observation in feeding experiments. In this way we could determine exactly when food filled the body of the fly, and also observe the time of the first and subsequent deposits.
4. All apparatus, petri dishes, slides, etc., were sterilized.

5. Sterile, filtered water was used for washing purposes and for moistening food material for flies.
6. Fresh carbol-fuchsin stain for each set of smears was used.
7. Complete notes and tables were kept.

Results: It was determined —

1. That a fly would feed continuously for from three to thirty-one minutes.
2. That the digestive tract was completely emptied in from fifty-two to seventy-two hours.
3. That the average number of excreta deposits was: in Musca domestica ♂, during forty-six hours, 25 + M. D. ♀ 35 + (during the first twenty-four hours the greatest number of ejections occurred and after the first eight hours). Stomoxys calcitrans ♂ during sixty-one hours, 40 + S. C. ♀ 86 + (during the first twenty-four hours the greatest number of ejections occurred and after the first three hours).
4. That the average time after feeding before the first ejection varies considerably between five and forty-five minutes, but the average is about thirteen minutes.

It is a matter of interest to know that the ejections of *Stomoxys calcitrans* are darker and larger than those of the other species used.

The excreta deposits examined were from flies:

a, Captured in rooms of patients; b, That had fed on the lesions of patients, and those — c, Fed on contents of pustules that had been removed from patients and which contained large numbers of bacilli.

It was found that of twelve flies of different species caught in the rooms of patients only two (Musca domestica) showed the acid-fast bacilli in the excreta deposits, and that of six flies (also Musca domestica) allowed to feed on the lesions of patients the excreta gave negative results. This might possibly be due to the fact that the flies did not feed long or continuously and were more agitated than others under less disturbing conditions.

From the forty-one flies fed on the contents of pustules the best results were obtained. Of twenty-one flies (Musca domestica), fifteen were negative and six positive. Of

Stomoxys calcitrans, twenty were used which gave four negative and sixteen positive results. Of another series of six flies (three of each species), two gave positive findings, two questionable acid-fast bacilli, and two were negative.

The probable reason why greater success was had with flies fed with pus was because each globule of pus was moistened with sterile water, which made it easier of ingestion, and, moreover, the fly was left undisturbed while feeding.

Acid-fast bacilli were found only once in "vomit spots" (regurgitation).

Flies caught in the laboratory, administration building, and stables did not show the acid-fast bacilli. The distance of these buildings was approximately two hundred and fifty yards away from the dwellings of the patients. From our limited experiments Stomoxys calcitrans plays probably a more important part than any other species as a carrier of the acid-fast bacilli of leprosy.

In no other species of flies, other than Musca domestica and Stomoxys calcitrans, were the acid-fast bacilli found in the excreta.

Besides the acid-fast bacillus other organisms were found, principally micrococci and a non-acid-fast slender bacillus.

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